1. Nov/2020/Paper_9709/61/No.3

The masses, in kilograms, of female and male animals of a certain species have the distributions $N(102, 27^2)$ and $N(170, 55^2)$ respectively.

Find the probability that a randomly chosen female has a mass that is less than half the mass of a randomly chosen male. [6]

2. Nov/2020/Paper_9709/62/No.7

Before a certain type of book is published it is checked for errors, which are then corrected. For costing purposes each error is classified as either minor or major. The numbers of minor and major errors in a book are modelled by the independent distributions N(380, 140) and N(210, 80) respectively. You should assume that no continuity corrections are needed when using these models.

A book of this type is chosen at random.

(a) Find the probability that the number of minor errors is at least 200 more than the number of major errors. [5]

The costs of correcting a minor error and a major error are 20 cents and 50 cents respectively.

(b) Find the probability that the total cost of correcting the errors in the book is less than \$190. [5]

3. June/2020/Paper_9709/61/No.3

The masses, in kilograms, of large sacks of flour and small sacks of flour have the independent distributions $N(40, 1.5^2)$ and $N(12, 0.7^2)$ respectively.

(a) Find the probability that the total mass of 6 randomly chosen large sacks of flour is more than 245 kg. [4]

(b) Find the probability that the mass of a randomly chosen large sack of flour is less than 4 times the mass of a randomly chosen small sack of flour. [6]

4. June/2020/Paper_9709/62/No.1

The masses, in grams, of plums of a certain type have the distribution $N(40.4, 5.2^2)$. The plums are packed in bags, with each bag containing 6 randomly chosen plums. If the total weight of the plums in a bag is less than 220 g the bag is rejected.

Find the percentage of bags that are rejected. [4]

5. June/2020/Paper_9709/63/No.2

Each day at the gym, Sarah completes three runs. The distances, in metres, that she completes in the three runs have the independent distributions $W \sim N(1520, 450)$, $X \sim N(2250, 720)$ and $Y \sim N(3860, 1050)$.

Find the probability that, on a particular day, Y is less than the total of W and X. [5]

6. June/2020/Paper_9709/63/No.4

The random variable A has the distribution $\mathrm{Po}(1.5)$. A_1 and A_2 are independent values of A.

(a) Find $\mathrm{P}(A_1 + A_2 < 2)$. [3]

(b) Given that $A_1 + A_2 < 2$, find $\mathrm{P}(A_1 = 1)$. [4]

(c) Give a reason why $A_1 - A_2$ cannot have a Poisson distribution. [1]

7. March/2020/Paper_9709/62/No.6

The volumes, in millilitres, of large and small cups of tea are modelled by the distributions $N(200, 30)$ and $N(110, 20)$ respectively.

(a) Find the probability that the total volume of a randomly chosen large cup of tea and a randomly chosen small cup of tea is less than 300 ml. [4]

(b) Find the probability that the volume of a randomly chosen large cup of tea is more than twice the volume of a randomly chosen small cup of tea. [6]